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AMERICAN FOUNDRYMEN'S

ASSOCIATION.

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The American Foundrymen's Association is not responsible for any statement or opinion that may be advanced by any contributor to this Journal.

PROCEEDINGS OF THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia on Wednesday, October 7, the president, Francis Schumann, occupying the chair.

The reading of the minutes being dispensed with, Secretary Evans presented the report of the Executive Committee, in which it takes occasion to express the hope that with the election out of the way, the foundries will find a better business than has prevailed during the summer months.

Reports from the different sections of the Price Committee being called for, P. D. Wanner, of the Reading Foundry Company, representing the cast iron pipe section of the committee, said: "I have nothing of special importance to report regarding the foundry trade. I can report nothing more favorable than has been reported for some time prior to this meeting. Founders are all living on hope, and it seems to me that nearly everything is put off until after election. The pipe trade is exceedingly dull. The pipe works of my company have been closed for some months, and we have a large stock on hand. Some of the other

foundries are going ahead partially, but I do not think any of them are what you might call busy, and prices are anything but remunerative."

Nomination of officers for the ensuing year, to be elected at the November meeting, being next in order, the following were nominated: President, P. D. Wanner, Reading Foundry Company, Limited, Reading, Pa.; Vice-President, Thos. Devlin, Thos. Devlin & Co., Philadelphia; Treasurer, Josiah Thompson, J. Thompson & Co., Philadelphia; Secretary, Howard Evans, J. W. Paxson & Co., Philadelphia; Executive Committee, Walter Wood, R. D. Wood & Co., Philadelphia, Chairman; Thomas Glover, Glover Bros., Frankford, Philadelphia; E. E. Brown, E. E. Brown & Co., Philadelphia; Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia; Wm. F. Sauter, G. Rebmann & Co., Philadelphia.

The matter of the disposal of the surplus from the convention fund then being brought up, it was after some discussion decided to hand the same to the treasurer of the association, to be used for association purposes, such an arrangement having been found to be in accordance with most of the wishes of the contributors to the fund. The amount was stated to be $1,154.

The secretary announced that he had received a letter from a concern in Buffalo engaged in the manufacture of malleable iron castings, asking why their castings after going through the tumbling machines should rust quicker than castings obtained from another maker. Why should one iron rust quicker than another, they asked, and what would prevent it?

Mr. Devlin held that it was not owing to the rumbling at all, but possibly was due to imperfect annealing, probably by using too much sal ammoniac in the charging. If they would use less sal ammoniac in the packing it might stop the rust to an extent.

George C. Davis, chemist of Thos. Devlin & Co., Philadelphia, then read a paper on "The Analysis of Coke," exhibiting the apparatus necessary in the analysis, likewise the chemicals and solutions in the different stages of determination. The following is the paper:

"ANALYSIS OF COKE."

Coke plays so important a part in the production of iron and steel in all stages of the process, and may so largely affect the quality of the product, that it becomes almost a necessity to be able to determine upon its suitability for use in blast furnace or cupola. The furnace manager wishes to know the percentage of sulphur and phosphorus present, as well as the amount and composition of the ash. In a blast furnace practically all the phosphorous from the coke is found in the pig metal. In the cupola the conditions are different. Let us assume that it requires 1 pound of fuel to melt 7 of iron. I know that my placing the ratio of iron to coke at 7 to 1 will be criticised, but I am convinced that this is nearer the truth than the 16 to 1 ratio we hear of from some foundrymen and politicians. Assuming our coke to contain 0.03 per cent phosphorous, which is higher than any sample I have ever analyzed, it follows that the per cent of phosphorous in the pig would not be increased more than 0.004 per cent. So small an increase as this would be of no importance even in malleable work, and as I am speaking to-night with especial reference to foundry practice I think we may eliminate the determination of phosphorous in coke from among the numerous things the foundryman has to worry over.

In the cupola the amount of slag is small, and may vary widely in composition provided it is fluid. Except in long runs in large cupolas the slag is not tapped out, and little attention is paid to it. In fact, I am afraid that many small users of iron omit the limestone altogether, and the result is often a badly stuck up cupola which requires some time to repair when a few pounds of limestone would have prevented the trouble. The usual practice is to add from 20 to 40 pounds of limestone per ton of pig. This amount is ample to flux the sand adhering to the pig and to supply any deficiency of base in the coke ash. We conclude, therefore, that it is the amount of the ash that is of most importance to the foundryman, and it is the so-called proximate analysis of coke that I shall describe to you. In work of this kind it is very important that the conditions should always be the same. The necessity for this is still more marked in soft coals, where a

slight change may produce a large difference in results, but for sake of uniformity we treat all samples of fuel under the same conditions. To determine the moisture, from 1 to 2 grams of the finely powdered sample is weighed out into a platinum crucible and dried for one hour at a temperature of 100 to 105 degrees in an air bath. While this is being done another sample is weighed into a platinum crucible and ignited for 3½ minutes over a Bunsen lamp, and then for 3½ minutes over a blast lamp. After cooling in a desiccator and weighing the loss is calculated as moisture and volatile combustible matter. In a like manner our first sample gives us the moisture, and by subtraction we find the per cent of volatile combustible matter. The second sample is now ignited until all the carbon has burned off, when by again cooling and weighing we have the ash. By adding together the percentage of moisture, volatile combustible matter and ash and subtracting from 100 we have the amount of fixed carbon. The time of ignition, 7 minutes in all, in determining the volatile matter was fixed some years ago by the chemist of the Iowa Geological Survey by a series of experiments, and has since been adopted by nearly all the chemists in this country. Unless the coke has been carefully made the amount of volatile matter will seldom exceed 2 per cent. I recently had a sample of poor coke containing over 4 per cent volatile combustible matter, but this was exceptional. Such coke has a tendency to burn out too quickly in the upper part of the charge, but this phenomena is much more noticeable in a blast furnace than in a cupola. It does not always follow that a coke lowest in ash is the best. I have noticed that the purer cokes are often weak and crushed easily, while those containing an average amount of ash, say 8 per cent, gave much better economy, as there was less loss in braise. This, however, is a matter that has to do with the physical rather than the chemical examination.

For determining sulphur there are two methods, and the one I shall describe, which is probably the more often used, is known as Eschka method. We take 1 gram of coke, and after mixing well with 1½ grams of Eschka mixture, which contains two parts calcined magnesia and one part of dry carbonate of soda, transfer

the whole to a platinum crucible. About $\frac{1}{4}$ gram more of Eschka mixture is poured on, and the crucible inclined on a triangle. Heat is now applied rather slowly at first, and in the course of an hour the coke will have burnt off, leaving all the sulphur present in the combination with the soda. The process is hastened by frequent stirring with a platinum wire. After cooling the crucible is placed in hot water and kept warm a few minutes. The magnesia is insoluble, while the sodium salts pass into solution. By filtering we get rid of the magnesia. To the filtered solution is now added a little bromine water and 3 c.cm. of hydrochloric acid. The bromine insures the complete oxidation of the sulphur to sodium sulphate, while the acid decomposes the excess of sodium of carbonate present. The solution is now concentrated by boiling; the excess of bromine and carbonic acid gas passes off and we are now ready to throw down the sulphur, as sulphate of barium, by adding a soluble salt of barium. The barium sulphate is a heavy white precipitate, which settles to the bottom of the beaker. We now filter off the precipitate and wash with hot water, place filter and precipitate on a crucible and heat gently until the filter is charred. By increasing the heat the filter is burned off while the barium sulphate, which contains 13.76 per cent of sulphur, remains. After cooling in a desiccator the precipitate is weighed and per cent of sulphur calculated as usual. In coals sulphur exists in combination with lime as gypsum; with iron as pyrites or with the carbon compounds as organic sulphur. In the process of analysis part of the sulphur is driven off with the volatile matter, a part remains with the fixed carbon, while the rest remains with the ash. It is impossible to correctly apportion the sulphur among these, so it is reported separately. Coke usually contains from $\frac{1}{2}$ to 2 per cent of sulphur. In the cupola a part of the sulphur is always taken up by the iron, but the addition of lime and hot melting have a tendency to prevent this, for at a high temperature lime has a greater affinity for sulphur than iron. Fortunately many of the West Virginia cokes run low in sulphur, 0.60 per cent and under, giving the foundryman a much purer coke than was formerly obtainable.

Mr. Davis, in further explanation of the paper, said: "There is one thing I should explain. I made the statement that the analysis took some time. Of course a chemist in working could attend to a number of analyses. A delay is caused occasionally by the slow settlement of some solutions, several hours elapsing before they are completed."

COKE VS. COAL IN MELTING.

Mr. Schumann asked whether it was not a fact that coke had been more extensively used in consequence of the inequalities existing in coal rather than the difference in cost. Mr. Outerbridge replied that he did not think so. Mr. Schumann, giving his own experience, said that his company used coke because they could not get good coal. They once used coke to mix their charge, using probably a quarter coke, until finally they used nothing but coke, a condition largely due to a lack of good coal. Mr. Devlin believed that one of the chief reasons for using coke was that it was quick melting. He had found it possible to melt in 35 per cent less time than had been the case where the best coal mined had been used. For that reason alone he used coke. Mr. Whitney reported that his firm used coke for the same reason. They used coal in the bed, but coke in the charges. Mr. Carlton, of the Pratt & Whitney Company, Hartford, Conn., reported he had used coke for several years in part, but never as a general thing entirely. He had found that he could do better with part coal. He did not believe that one had any advantage over the other in producing good castings. He used coal on the bed and on all the intermediate charges. Mr. Schumann said that his company had burned nothing but coke, both for the bed and all through the charges. One of their cupolas was 18 inches, another 48 inches and another 60 inches diameter, and they made castings running from 100 to the ton to castings of 20 tons each. They had made plates $\frac{1}{4}$ inch thick, 62 inches wide and 17 feet long, and the same cupolas melted the iron for castings weighing 20 tons. From the 18-inch cupola they melted 4,000 pounds, and it was charged with nothing but coke. With the other cupolas they also used coke exclusively. The efficiency of coke, aside

from its theoretical advantages, could not, he thought, be denied when such results were obtained. It was necessary, to run a large plate, to have very hot iron. As he had previously stated, they formerly used coal, and at a time when they had a contract for making wire benches, which, as was well known, were about 18 inches high, 14 inches wide, and were very thin. These benches were made from standard irons, and were cast ahead for the convenience of the machine shop. The coal was of such a nature that the castings could not be touched with the ordinary tools in the machine shop. He thought the fault attributable to the pig iron men, but was afterward convinced that it was due to the coal.

THE CENTRAL BLAST CUPOLA.

Mr. Moore asked whether any one present had had experience with a central blast cupola. Mr. Carlton reported that he had used one, and took it out. Not because he did not like it, but because the furnace was not large enough. Dr. Kirk said that he had not had any experience with a central blast cupola. He had heard of them and had been to see them, but had always been told that they were out of order. This appeared to be an objection to the cupola. Great advantages were claimed for central blast cupolas in point of economy. A center blast could be used to advantage in a large cupola, but in a small one he did not think it would be of value. Mr. Carlton stated that he had used his cupola a month with the center blast. He also used some 1-inch steam pipe, which he carried through the center of the wind pipe to produce gas. A trouble he experienced with the steam pipe was to get a material that would stand the intense heat at the last end of the charge, as at that point his steam pipe generally melted. He never had any trouble with the wind pipe. Mr. Evans remarked that a center blast cupola was in operation at the foundry of the Wilmington Pipe & Foundry Company, Wilmington, Del. The proprietor of the works said that he got very good results with it, but it seemed to get out of order. There is a cap which goes over the center tuyere of the cupola, and a hole in the drop plates, and the central tuyere is put in position

and held there. They seem to have more or less trouble in keeping the cap in condition and stopping the slag from forming around the openings to the tuyere. The cupola is a small one, lining up to 35 inches.

Mr. Evans then stated that he had been informed that lower prices existed in Philadelphia for castings than in any other part of the country, the prices ranging from $1\frac{3}{4}$ to 2 cents per pound for machinery castings. Mr. Schumann thought that such a condition of affairs might be accounted for when it was remembered that more foundries were to be found in Philadelphia than in any other part of the country.

COST OF CASTINGS.

The subject of cost of castings was then taken up. Mr. Moore said that his first cost was the cost of the melted iron in the ladle. Then the molder's time and the other labor and materials was taken into account. Mr. Rebmann referred to the fact that most of the work at his foundry was piece work, so that by counting the cost of the mixture first and adding the cost of the labor and materials they got pretty near to the real cost of a casting.

Mr. Schumann reported that he had for the last six or seven years attempted to find out what his castings cost. The time of the molder on every job was kept. The weight of the casting was known, how much sand and coke was used during a year, how much molasses, flour and core sand, and how many shovels and sieves were used. The time of the cupola attendants, sand mixers, foremen, and others having to do with production was also accounted for. In all there were, he said, about 15 items to count in the cost, and the cost, exclusive of melting, amounted to a shade over 2 cents, while the melted iron would cost about $\frac{7}{8}$ cent. Deducting the shovels and the sand, the remainder is the cost. Mr. Devlin called attention to the fact that this same talk of cost was heard 40 years ago, and men were then saying that it was impossible to make castings at the prices that were then ruling. He heard the same talk to-day, but he did not hear of any foundries going into bankruptcy. The question of cost was a very difficult one to arrive at. A solution of it was almost impossible for various reasons. For instance, some castings

weighed 25 to 75 per cent in gates, etc. Again, it was sometimes hard to get the cast just right, and they would have to be made again. To get at cost he took all his material bought during the year, pig iron, coal, coke and everything that enters into the melting of iron, and accurately ascertained the cost of each. An average was then taken, iron so much per pound and melting so much, although they had a standard for iron and melting. All they had to take into consideration when figuring on a job was the labor of molding. In this way they knew pretty well what work was going to cost before it was taken. The molding was the only thing they did not really know the exact cost of, and they had to figure on this as best they could. He believed a system of this kind enabled any one to give a reasonable price before a contract was taken. According to Mr. Moore such a system might work pretty well in a foundry where the castings were small and regular. But in his establishment it would be a difficult thing to establish costs on the year's production, as one class of work would cost much more than another class.

Mr. Schumann called the attention of the younger men in the business to an interesting problem. There was a relation between the cost of molding a casting and the volume of sand forming the mold. Suppose a flask, he said, contains a cubic foot of sand, and the volume of the casting is 10 inches and the volume of the void 20 inches, the difference being made up in cores and one thing or another. Then there is a certain relation between those three elements and the cost of molding, when you speak of green sand molding. The same thing applies to loam castings, but better to green sand castings.

PROCEEDINGS OF THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held at the Great Northern Hotel, Chicago, at 7:30 p. m., October 21, 1896. The meeting was called to order by William Ferguson, Vice-President. Applications for membership by the Ingersoll-Sergeant Drill Company, of New York, for active and Henry W. Carter, of Chicago, for associate were acted upon and the applicants were elected. The Secretary then read the report of the Committee on Apprenticeship, signed by William Ferguson, G. H. Carver and A. J. Oehring.

REPORT OF COMMITTEE ON APPRENTICESHIP.

To The Western Foundrymen's Association, Chicago, Ill.:

Gentlemen—The Committee on Apprenticeship appointed by your body at the March meeting, after due investigation and consideration, beg leave to submit to you their final report, and in doing so would ask that this association take some definite action that will encourage foundrymen to adopt some such system as this committee advises.

It seems to be an acknowledged fact that a recognized apprenticeship system is not only desirable, but necessary, to keep up the standard of efficiency being called for in the foundry business, and in order to cover the entire ground and take care of the various branches of the trade, and to have the least possible complication, we have divided into three different classes, with suitable terms as to time and compensation in each case, as follows:

1. The general machinery molder, embracing various classes of work from marine and stationary engines to all kinds of general machinery.

2. The stove-plate and agricultural implement molder. The reason for putting these two into one class is not so much on account of the similarity of the work, but because the systems and methods in both cases being usually based on piece-work, it was thought best to advise an indenture that would be suitable to these two branches.

3. Bench and brass molders. Possibly it would not be necessary to take them out of class No. 2, only that in these branches there is not so much skill required as in the first and second classes; hence it does not require so long a term for the learner, and in our judgment calls for the division as made.

In Class No. 1, known as machinery molders, owing to the diversified kind of work, ranging from the lightest to the heaviest, we believe a four-years' term short enough for any young man to be able to learn enough of the business to make him a proper mechanic, and where loam work is to be accomplished, we would advise one additional year on this special line. The youngest age at which your committee believes it advisable for an apprentice to take up this trade is 16 years, and the requirements or qualifications should be, first, a sound and strong body, well developed, a good common school education, coupled with a desire to learn this especial trade. The duties for each separate year and compensation for same will be fully set forth in the form of indenture submitted to you with this report.

We would strongly recommend the offering of a bonus for extra efficiency, and believe it would prove most beneficial if given at the end of each year; but in no case should the same be given unless the foreman is fully satisfied that the apprentice has fulfilled all requirements.

We would also advise keeping back 25 cents per week after the first year, as a guarantee of good faith and continuance. Along with this we believe it would be to the best interest of all concerned to have the boy backed up by a parent or guardian to see to it that his interests are fully looked after.

Class No. 2.—Agricultural and stove molders.—As the work embraced in this class is not of such a diversified nature, nor has a great amount of core-work attached to it, your committee would advise a three-year term as being long enough for a learner to master the trade, so as to be able to do justice to himself and employer. Where piece-work is the system, we believe it desirable to have the apprentice schooled in the same way, as it occurs to us that it would be much better for the boy, inasmuch as he

would have his bad work discounted as is usual with journeymen, thus giving him the stimulus to have as little loss as possible, and for the stronger reason that it would be preparing him in the same way as he will have to work when he becomes a full-fledged mechanic. We would advise 17 years as the best age to start an apprentice in this class, for the reason that he will be put to more laborious work sooner than in the other (No. 1) branch of the molder's trade, and the term of indenture will end at an age not too young to assume the duties of a man. Qualifications of applicants should be the same as in Class No. 1. The duties for each separate year, and compensation for same, are set forth in a copy of indenture accompanying this report. We also believe it desirable to offer a bonus in this class for extra efficiency, the same to be paid at the end of each year, or when the employer believes it to be merited. It also appears necessary to us to keep back a small portion of wages after the first year as a guarantee of good faith and continuance.

Class No. 3.—Bench and brass molders.—While there is much skill required in the production of good work in some parts of both lines in this class, as a rule there is not so much as in the other two classes, for the reason that the larger part of this work is made from matchboards or cards, and patterns and rigging are prepared in such excellent shape that the actual molding is a comparatively simple matter. We believe a two-years' term in this class is sufficient, and the youngest desirable age at which to start an apprenticeship to be 18 years, for the reason that he must be strong enough to handle most of his molds alone, and any preliminary work he would have to do could not be of a much lighter character. Qualifications required from all applicants should be the same as in the previous classes. Duties for each year and compensation for same will be defined in a separate indenture attached. We also believe it desirable to offer a bonus for extra efficiency in this as in the other branches of the trade, and would advise keping back a small weekly amount in second year, as a guarantee of good faith and continuance.

Indenture for Machinery Molders' Apprentice.

This agreement, entered into this......day of..........A. D. 189.., between ...., a firm or corporation organized under the laws of the State of.............., party of the first part, and.................., a minor, and............ parent or guardian, parties of the second part, witnesseth, That the said party of the first part agrees to take......party of the second part, into its employ and service for the period of four (4) years from that date for the purpose of learning the trade of iron molder, as carried on in its works, and that the said minor party of the second part shall truly and faithfully work and serve for said period in such capacities as the foreman may from time to time direct, and that he shall obey all rules and regulations of the works, and the party of the second part also agrees to abstain from the use of intoxicating liquors during the term of his apprenticeship. The duties of the apprentice are defined as follows, but may be deviated from so long as it does not impair the apprentice's opportunity to learn the trade thoroughly: First year to be spent in core room to learn the making and use of cores, along with care of core boxes and necessary tools. Second year at light molding of various kinds and assisting in the care of patterns and helping molders, as the occasion may require. Third year to be advanced to heavier and more difficult class of work as fast as he may prove himself capable. Fourth year, the first nine months to be spent on the best class of work in the shop, whether made in dry or green sand, and the last three months of his term to be spent at the cupola, in order to gain some knowledge of the melting and mixing of irons, along with the care of cupola and ladles.

Compensation for services rendered while learning this trade shall be, for first year, \$4 per week. For second year, \$5 per week. For third year, \$6 per week and fourth year \$7 per week, with an additional bonus of \$10 at the end of the first year, \$20 at end of second year, \$30 at end of third year and \$40 at the end of apprenticeship, it being understood that these bonuses are optional on the part of the party of the first part, when he is thoroughly satisfied that the party of the second part has faithfully perfomed all

requirements. Where an additional year on loam work is taken up party of second part shall receive for this year $8 per week, subject to a bonus of $50 at the finish, upon same conditions as previous years.

It is further agreed between the parties hereto that the party of the first part shall retain from the pay of the party of the second part the sum of 25 cents weekly until the end of the term of apprenticeship, and that the money so retained shall be forfeited to the party of the first part in case the party of the second part does not fully complete his term of apprenticeship, or fails to give cheerful obedience to the rules of the works or to the proper authorities.

Indenture for Agricultural and Stove Molders' Apprentice.

This agreement entered into this......day of........., A. D. 189.., between............, a firm or corporation organized under the laws of the State of.............., party of the first part, and.............., a minor, and........, parent or guardian, parties of the second part, witnesseth, That the said party of the first part hereby agrees to take.........., party of the second part, into its employ and service for the period of three years from date, for the purpose of learning the trade of iron molder as carried on in its works, and that the said minor party of the second part, shall truly and faithfully work and serve for said period in such capacities as the foreman may from time to time direct, and he shall obey all rules and regulations of the works, and the party of the second part also agrees to abstain from the use of intoxicating liquors during the term of apprenticeship.

The duties of apprentice are defined as follows, but may be deviated from so long as it does not impair the apprentice's opportunity to learn the trade thoroughly: First six (6) months day work, to be spent in taking care of patterns and core-boxes. Second six (6) months in the care of cupolas, ladles and flasks, so as to become conversant with their use before starting to mold. Second year to start at the more simple class of work, and the more difficult pieces of work to be given him as fast as he proves himself competent. Third year to be spent on the most difficult class of work in the shop.

Compensation for services rendered while learning this trade shall be as follows: First year, $5 per week, day work. Second year, board prices, less 15 per cent piece work. Third year, board prices, less 10 per cent piece work, and a bonus of $10 for extra efficiency at the end of the second year, and $20 at the end of apprenticeship; the payment of bonuses of course being optional on the part of the party of the first part when he is thoroughly satisfied that the party of the second part has faithfully performed all requirements.

It is further agreed between the parties hereto that the party of the first part shall retain from the pay of the party of the second part the sum of 25 cents weekly until the end of the term of apprenticeship, and that the money so retained shall be forfeited to the party of the first part in case the party of the second part does not fully complete his term of apprenticeship or fails to give cheerful obedience to the rules of the works or to the proper authorities.

Indenture for Bench and Brass Molders' Apprentice.

This agreement entered into this.... day of......A. D. 189..., between................, a firm or corporation organized under the laws of the State of ...., party of the first part, and.............., a minor, and........, parent or guardian, parties of the second part, witnesseth, That the said party of the first part hereby agrees to take.........., party of the second part, into its employ and service for the period of two years from date, for the purpose of learning the trade of iron molder as carried on in its works, and that the said minor party of the second part, shall truly and faithfully work for said period in such capacities as the foreman may from time to time direct, and that he shall obey all rules and regulations of the works, and the party of the second part also agrees to abstain from the use of intoxicating liquors during the term of apprenticeship.

The duties of apprentice are defined as follows, but may be deviated from so long as it does not impair the apprentice's opportunity to learn the trade thoroughly: The first six months to be spent around cupola, ladles and general labor, so as to become

familiar with his surroundings. Balance of apprenticeship to be devoted to molding entirely, and to be given charge of work and a better class of it, as fast as he becomes proficient.

Compensation for services rendered while learning this trade where day work is the system: First year, $6 per week. Second year, $8 per week.

Where piece work is the shop rule, $6 per week for first six months. Board prices less 20 per cent for second six months. Board prices less 15 per cent for balance of term, and upon proper and satisfactory completion of term a bonus of $10 at the end of the first year and $20 at the end of second year shall be added to above, optional with first party.

It is further agreed between the parties hereto that the party of the first part shall retain from the pay of the party of the second part the sum of 25 cents weekly until the end of the term of apprenticeship, and that the money so retained shall be forfeited to the party of the first part in case the party of the second part does not fully complete his term of apprenticeship, or fails to give cheerful obedience to the rules of the works or to the proper authorities.

After reading of the report it was decided to postpone the formal discussion until a later meeting. The thanks of the Association were extended to the Committee on Apprenticeship, and the committee was discharged. The Secretary was instructed to write several interested people requesting them to present written discussions of this report. The meeting then adjourned.

PROCEEDINGS OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The Pittsburg Foundrymen's Association met by call of the President, Monday evening, October 26, in the rooms of the Engineers' Society of Western Pennsylvania. There were present the following: Robert Taylor, Taylor, Wilson Co., Ltd.; F. N. Zimmers, Union Foundry & Machine Co.; John A. Meighan, Dawson Bros. & Meighan; Wm. A. Bole, Westinghouse Machine Co.; Albert D. Wilkins, Pittsburg Locomotive Works; Phillip Mathes, Brittain, Graham & Mathes; James Lathwood, James Lathwood Co.; Howard Hooker, Rogers, Brown & Warner; R. B. Lean, Crescent Foundry & Construction Co.; John C. Reed, Standard Mfg. Co.; James Boyle, Westinghouse Electric & Mfg. Co.; Wm. Altsman, James Collard & Co.; J. S. McCormick and T. E. Malone, J. S. McCormick Co.; J. McM. Porter, Porter Foundry & Machine Co.; Jos. S. Seaman, Seaman-Sleeth Co.; F. W. Gerdes, Hall Steam Pump Co., and Jas. R. Mills, Jr., Iron Trade Review.

The meeting was largely one of consultation, and numerous suggestions and plans were discussed informally. The executive committee were unable to report as to progress made in securing a permanent meeting place. Overtures from the Engineers' Society have been received, but as a committee from that body cannot be seen till a later date, there was no proposition upon which action could be taken.

The secretary stated that responses from foundrymen in the Pittsburg district were most gratifying, but among many an erroneous idea was held regarding the purposes of the association. It was the sense of the meeting that a vigorous effort should be made to secure the co-operation of all foundrymen in Allegheny County and surrounding territory. To this end it was ordered that letters be addressed to all foundrymen in the Pittsburg district, explaining the true character of the association, and that a copy of the adopted constitution and by-laws be likewise enclosed, in order that any erroneous impressions might be re-

moved. Informal discussion followed and all present were enthusiastic over the outlook. The topic announced by the executive committee for the meeting was "The Use of Test Bars in Foundry Practice," but owing to the press of business relative to the organization and methods of extension, the subject was carried over for a future meeting. Numerous suggestions were contributed for the consideration of the executive committee, and the meeting adjourned subject to the call of the president.

The Pittsburg association is organized substantially on the same basis as are the Eastern and Western and other associations. Its president, Mr. Robert Wilson, is also vice-president for the Middle States, of the American Foundrymen's Association. The objects of the Pittsburg association are thus stated in the by-laws:

Article 2.—The objects of this association shall be the advancement of the interests of the foundry operators, or all who are concerned in the casting of any kind of metal in sand, loam or other molds for any purpose, to promote the mechanical and industrial interests, to collect for the use of the association all proper information connected with the foundry business and to promote harmony and encourage uniform customs and actions among foundrymen.

The membership of the association is constituted of persons and firms described in the following:

Article 2. Sec. 2.—Any person, firm or corporation engaged in the production of castings of any kind, as employer, superintendent, foreman, chemist, etc., may be elected an active member.

Sec. 3.—Any person whose knowledge or services are valuable towards the objects of this association may be elected an associate member.

Regarding fees, the by-laws provide:

Article 4. Sec. 1.—All persons, firms or corporations who have been elected to either active or associate membership in this Association shall pay to the Treasurer the sum of $5 as an initiation fee before a certificate of membership shall be issued to him or it.

Sec. 2.—The annual dues for each active or associate member of the association shall be $6, payable annually in advance.

The initiation fee of $5 is not required from members coming into the association in the first six months.

A REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

AMERICAN MACHINIST

Oct. 8—Contains an article under the heading, "Machine Shop Oculists" that is worthy of some notice, even though the contents are not flavored with the sweet smelling odor of mechanics. While this article is written for machinists it can be applied to the foundry department with ease, where it is a common occurrence to see some one backed up against the wall, while another goes rumaging around his eye for things not wanted there.

Oct. 15—John Frank illustrates a trip for a foundry drop, the simplicity of which enables any shop to provide themselves in this respect.

Oct. 22.—"Molding Large Pulleys" is a contribution by L. C. Jewett, in which the author advocates shops doing this class of work, to fix up a special floor with better facilities for executing same.

Illustrations accompany this article showing in detail the most important features connected therewith.

The following will show the trend of Mr. Jewett's views:

"This method dispenses with the tedious and laborious operation of sweeping up the different levels, for bottom of hub core, elevation for arm cores, and level for bottom of rim and joint for cheek.

"In foundries where such pulleys are made, there should be a floor selected where swept pulleys should have a home, as it were, and they should be made on that floor. Have a cross, imbedded two inches below the floor level—this cross to be a permanent fixture and to have bosses, or shoulders, to center the rings to be hereafter mentioned; the hub of the cross to be bored out and squared off, so that the hub core box will drop right in with a loose fit. It might be necessary to line with brass to prevent rusting. The flange of hub core box and rings to be trued up to suit

the level for the narrowest faced pulley liable to be required. The hight of hub core box and ring flange is the required hight for arm cores to bring arms in center of a 12-inch faced pulley, we will say. Should a deeper or wider faced pulley be required, cast-iron or wooden blocks could be placed under the arm cores to elevate one-half of the increase in face of pulley above 12 inches. The outside of this pulley mold, that is, the cheek, could be swept up in loam with some economy of time, and an arrangement could be made with two 2x6 or 8-inch planks of a length to suit each single cheek, to provide a center to sweep on the loam. These cheeks could be filled with bricks tightly keyed in, laid without mud or chinking, and made to do service for a number of times with a little patching, or they can be rammed up, as usual, with green sand.

"When we have all the appliances working, the process will be as follows: The molder sweeps up the cheek, with loam, and while that is being done the other fellow, laborer or apprentice, is getting the spindle center in the hub of the cross; the ring for arm elevation is rolled in, and falls to the center every time without measuring as to its being central or for hight; sand is shoveled in between the hub core box and arm ring, where it will stay, it being only necessary to tramp it in until filled, when it could be given the butt of the rammer. Strike off even; lay in the hub core, then the arm cores; put in spindle with arm; fasten on rim segment for rim; and when the molder has the cheek done, the thing to do is to ram up the inside of the mold with green sand, as usual, all being done half a day or a day ahead of all time it has ben my experience to witness.

"Another advantage in sweeping up outside with an edge sweep in loam, and inside with a segment of rim for pattern, is that the segment can be made of any desired thickness, as the inside is the only part to be used, and a good wide fastening can be affixed securely at each end that will hold the pattern rigid, prevent springing when being rammed up, and further use of level will be unnecessary after once setting true and plumb.

"I have molded pulleys with a segment made with outside and inside radius on the same pattern, and the pattern so thin that

when ramming the outside, or cheek, it rammed in, and vice versa; so much so that the cheek could not be closed on. This was a thin rim, and more time was consumed in scraping and shaving, to get sufficient thickness, than would have been required to prevent the evil; and besides that, the pulley would be sadly out of balance, or liable to be.

"The method described here will necessitate the centering of the cheek by measuring the thickness, but that has to be done now where they stake the cheek when closing for the last time. On the outside of the segment, near the bottom, is a rib put on to enable a sweep to be guided to make a joint for the cheek; these cheeks should be of iron, of course."

THE ALUMINUM WORLD

Gives the latest foundry practice in casting aluminum. Among other things the paper says:

"The character of work for which aluminum is being used in castings to-day is of too varied a character to go very much into detail as to specific uses, but generally speaking, they are extensively used in the moving parts of weaving and printing machinery, and also in centrifugal machines. In this latter place aluminum castings probably show to better advantage than in any other specified use to which the casting can be put, for the reason that the force tending to break a casting is directly in proportion to its momentum, and the momentum is equal to the square of the velocity of the moving part multiplied by its mass, and in replacing brass castings with aluminum castings, we have only one-third the weight; consequently as this is a direct function of the mass, we have the force required to start the piece in motion, or to disrupt it after it is in motion, only about one-third that which is required or produced when a similar brass casting is used."

THE ENGINEER

Of London, Eng., contains a series of articles on "American Blast Furnace Practice." In the latest of these the author, John L. Stevenson, contrasts the American and English practices, and shows some of the rather curious differences existing.

THE FOUNDRY.

H. M. Ramp, in reviewing some articles relating to "Cupola Practice," which appeared in "The Foundry" earlier in the year, says:

"The center of the cupola requires very little blast, theoretically none; but the instant you move from the center on the radius the amount of blast required is constantly increased, for the area represents the blast necessity. The nearer the side of the cupola is approached, the greater demand it makes upon the blast volume, for if our blast was sufficiently concentrated and of such power as to force its major portion to the center the outside area would be robbed and cooled and cause greater disaster. For example, assume that in a 48-inch cupola the blast does not penetrate within six inches of the center, which would leave a circle of twelve inches in diameter in that point unsupplied with blast, a melting area of 113 square inches. Or, again, assume you reach the center, and the force and volume of the blast are so great you cooled the cinders and droppings around the outside diameter one inch thick, or forced the blast in so one inch would be neglected. The result would be that one inch on the outside diameter would cut off 150 square inches of melting area, considerably more than a twelve-inch circle in the center. Yet how often the cupola bottom is dropped and one, two, three, yes, and even six inches of accumulations will be found hanging to the side above the tuyers, cutting off hundreds of inches of melting area. Most certainly there is a reason for both of these conditions, and it is often the direct result of the dimensions of tuyers used. If the cupola accumulates around the edge, the tuyers are too large; too great a body of air is entering at one point, which cools anything that may be in its path before it becomes sufficiently heated. Too high blast pressure will also cause the same result.

"Many cupolas are driven beyond their capacity the first hour and melt rapidly, but gradually bring up and melt slower until at the end of the second hour their usefulness is at a practical end for that heat.

"The outside diameter of melting area is the portion that should meet our attention and consideration first; the center later.

"The cupola that works well all through a heat of two, three or four hours and drops clean and clear will be found a rapid and economical one to use, and the blast and tuyers will most certainly represent correct proportions. Center blast attachments are of comparatively recent origin, and their application is successful and economical, but the name "center blast" conveys the wrong impression. Practically our old style cupolas are center blast, for that is the point to which they endeavor to force the blast, while the so-called center blast of to-day is situated in the center and forces the blast to the outside diameter, the very point where it is needed most, and it is only plausible to suppose a cupola operated with one of these must constitute a great saving in time, wear of lining, to say nothing of possible economy in fuel, and, furthermore, is an exemplification of the idea just advanced that the outside melting area is of more importance than the center. Distribution of the tuyers or blast volume varies. Some cupolas have only four or six tuyers, while others will possess forty. One of the best working cupolas the writer ever saw had thirty-six two and one-half inch round tuyers, and the iron melted hot at a low ratio of fuel and great rapidity. But the practice of placing four or six large tuyers in a cupola of forty-eight inches diameter is undoubtedly an error, for the points between the tuyers do not receive their full quota of blast, and the points in front of the same are chilled and cooled by the excessive volume. Running a cupola correctly is based on common sense rules, and the reason so many mysterious, unexplainable things occur is simply because we have not sufficiently exercised our thinking faculties. Eliminate everything that is not reasonable, and different results will be obtained or cause shown why. If we were constructing a stove, we would not devote all energies to getting a draught to the center of the fire alone, but also to the ends and sides, which develop heat according to area contained."

W. J. Keep in his "Cast Iron Notes," explains how a variation may appear in iron taken from the cupola at different parts of the heat. Several other points that are presenting themselves in daily practice are also treated in the well known style of this author.

Henry Hansen illustrates "Some Foundry Kinks;" examples of actual shop practice in which he shows that there are several means within the reach of the molder to accomplish a given job in a better way than is usually the case.

THE IRON MOLDERS' JOURNAL

Contains a discussion on the relative value of leaving risers open or covered. As is the way with all questions, participants are found ready to take the stand on any side. The articles are chiefly to be commended for producing an argument, from which the reader may extract whatever points prove worth retaining in practice.

THE IRON AGE.

Oct. 1.—Has a paper from F. H. Daniels, who has lately returned from Europe. The author writes entertainingly of Dr. De Laval, the Swedish Edison, and his most recent undertaking in the direction of reducing ore to metallic iron by means of the electric arc. The present condition among the Swedish iron masters is also fully treated. The whole forms a timely contribution at present, when we are all more or less interested in knowing what others are doing in metallurgical matters.

Oct. 8—H. K. Landis treats "The Effect of Cold on Iron," and presents some of the conclusions reached by Le Chatelier, Prof. Steiner and Mr. Dewar along this line of inquiry.

The same issue contains an illustrated description of an electric smelting furnace recently patented by Joseph A. Vincent, of Philadelphia.

Oct. 22—The plan and an interior view of the Lorain Foundry Company's new plant at Lorain, Ohio, is shown, giving a fair idea of the latest approved construction in foundry buildings.

THE TRADESMAN

For October has a contribution by Wm. M. Brewer on "Coke Iron in the Brown Ore Districts," describing some of the changes that have lately taken place in the southern field.

E. H. Putnam tells how "To Make Clean Castings," dwelling on the importance that shapes of gates play in this matter and

some other observations along this line. He concludes with a description of a skimming gate that has been in successful use at the works with which he is connected: We quote one of the passages:

"Bear in mind that all foreign substance in molten iron rises buoyantly to the top surface, and if sustained above the level of the branch gate it cannot enter the mold. Some irons contain so much of foreign matter in the pig that it is almost impossible to insure a clean casting from them. The best skim gate may be rendered ineffective by willful pouring. If you start the flow of iron through the runner with sufficient force to raise and float the dirt high and safely above the branch gates, and then, before the mold is full, slack enough to relieve the upward pressure in the runner, the dirt will pass into the mold and you will have a defective casting. Therefore the pressure must always be sustained till the mold is full."

F. F. Hemenway has this to say about "Shop Ventilation:"

"So far as inclination goes I feel rather minded to vote the machinist the head and front mechanic of the world, which probably comes mainly from early associations. That is so far as relates to a good machinist just in line with his vocation. But when it comes to other things quite intimately connected with shop operations there is not so much to be said in his favor. This comes up from a recent visit to an eminent machine manufacturing establishment, situated in one of the eastern states. Not one of those establishments with a few dollars behind it, but one backed up with a million or thereabouts to hold it together. An establishment with no end to the machinists' talent in the way of ownership and management.

"The tools to work with are the best, office well appointed, but when it comes to the ventilation of work room it was about the worst that could be conceived. Place the best machinist in the land in such ventilated shops, force him to breathe cast iron dust a quarter of an inch thick, and his inherent and acquired ability is prostrated. You can't expect and you can't get good work from him. If you are called on to get out good work base your

ability to do so as much on the ventilation of your shop as you do on the tools your workmen have to work with.

"If I had shops in which natural ventilation was not practicable I would put in a little fan and blow or suck good air right up through every story of the shop, in the full belief that I was getting the best possible returns for the coal burned to do the work.

"You have no right to expect good work from men furnished with poor appliances, and the poorest of all appliances is poor air. When you build your shop build it with a good square idea of getting good air into it and bad air out of it, and brag as much about it as you do your engine and your tools. It will bear it."

(While the above remarks are evidently addressed to machinists, we think there is a double reason to direct the same words to our foundrymen. This matter has never been given consideration enough as a factor in shop production. It has been looked at as a luxury when in reality it is a necessity, and a paying investment it has proved to be in such instances where it has secured an introduction.—Ed.)

THE MECHANICAL WORLD

Of Manchester, Eng., in its issue of Oct. 2, has a short sketch from W. J. May, which we reproduce in full:

"In the preparation of cores, loam and dry sand work in the foundry, it often happens that considerable difficulty is found in arranging the vents, as the air and gases have to be taken off from parts which are not easy of access. Straws, rushes, string, and other materials are used with more or less success, but each has very obvious disadvantages, and very often the vents choke from causes which are very easy to find after the damage is done. Clearly, it is desirable that all the vents or gas channels should be clear and that the gases should escape freely when metal is poured into a mold, or blowholes and other faults will be caused, the eventual result being that the casting has to be 'filled' to hide the faults, or it becomes a waster; and in any case if it has to be planed or otherwise tooled, unless the casting be really sound,

it has but a poor chance. What is required is proper and efficient venting and a fluid metal free from dirt or sullage, and both are obtainable.

"So far as venting is concerned, Mr. G. J. Gibbs, of Bradford, is introducing a wax wire, which is embedded in the cores or molds while they are being made, and in drying, the wires melt and become more or less carbonized, the channels thus left being perfectly free and clear. Being made in sizes from 3-32 to ½ in. in diameter, this wax wire is suited to almost any class of work, and being flexible it can be used in the most complex and difficult work, while the cost does not prohibit its use.

"So far as the fluidity and cleanliness of the metal are concerned, ferro-sodium or other good flux will produce these, and really there is no reason why perfectly sound castings should not be produced when the materials referred to are used. At the same time the writer is quite aware that no accessories, however good they may be, will take the place of skilled labor and make a laborer equal to a mechanic, and skilled labor will only be assisted by using acessories such as those referred to."

Joseph Horner writes of English practice in turning out machine-molded gears, from which we extract the following passages:

"The other department of machine molding—that of gear wheels—needs the services of a good molder—a man of quite a different type from the operator of a molding machine. It is not that there is anything specially difficult about the molding of wheels, but it requires much care, neatness, and scrupulous accuracy. The machine is only a dividing engine, ensuring the accurate pitching-out and perpendicular withdrawal of the pattern tooth—nothing more. Very careful ramming, nailing, and venting are necessary to the formation of the tooth shapes, and every bit of the mold besides has to be prepared and fitted with the care which is essential to the production of true gears. The difference in the cost of gears is not due to any greater difficulty in the production of one than another, but solely because of the extra labor involved in some, more than in others. The cheapest wheel is a plain spur; but the addition of shroudings adds to the labor. A

bevel wheel is more tedious to mold than a spur. A double helical wheel, again, involves extra work. In each, however, the principles involved are the same; the teeth are pitched by the machine, and all the rest is a case of hand work. There is no form of gear which cannot be made by machine; many forms, in fact, are more readily and cheaply made thus than by pattern.

"Machine-molded gears include spurs, bevels, helical, worm, and screw wheels, without shrouds; with single or with double, half, or full shroudings; with arms or with plated centers. Wheels also can be cast to other wheels of the same or of different kinds, arms of any shapes can be made, any attachments can be cast with them, and dimensions may range from 2 or 3 in. up to 20 ft. The value of such a machine in a foundry doing a considerable quantity of gearing is great. It is a profitable investment in two ways: First, it is capable of producing more accurate results than those possible by hand work; and, second, it saves very much costly pattern work. With regard to the first matter, there are plenty of badly-made machine wheels. But that is either due to the machine having been allowed to get into bad order or to carelessness in molding. Eliminate these, and the gears are practically perfect. With regard to the second point, those who are old enough to remember the pre-wheel-machine days will know something about the makeshift methods which were resorted to to save the heavy cost of complete wheel patterns of large dimensions. Now the cost of preparing the necessary pattern parts for a wheel of large diameter is not greatly in excess of that for one of smaller dimensions. In fact, the cost of patternmaking does not affect a purchaser at all. He pays so much per hundredweight for a wheel of a given class, and whether pattern parts have to be prepared or not does not concern his account. There are, in fact, very few parts necessary for a plain wheel. They comprise the tooth block, the corebox, striking boards, and some small matters which are required to a greater or less extent, according to the character of the gear and its attachments.

"Any attachments can be rammed up in a machine-molded wheel, which would be nailed on a pattern wheel. Facings, bosses,

lugs, prints, etc., are readily inserted in the mold by measurement, and the machine arm and board are often utilized for the measurement of radial distances.

"A mold taken from a pattern may be cast along with a machine mold. Thus, a pinion and wheel can be cast together, with or without shroudings, bosses, etc.

"Machine-molded wheels may be split or cast in halves or in segments, precisely as in pattern molds.

"The pattern parts for machine-molded wheels should all be stamped clearly with the pitch, number of teeth, pitch diameter, and order number for which they were made, before being put into the stores. Then the blocks may be tied up with their boxes and boards, or they may be kept separately, and the latter utilized by slight alterations for other blocks. But each class of wheel should be kept on distinct shelves, and the blocks, etc., should go in rotation, according to their number of teeth. In this way a wheel can be found directly."

The same journal of Oct. 16 has a paper on "Core Gum," by "A Foreman Molder." This article seems to be identical with some of the core compounds on this side of the water and we reproduce it here to enable the reader to form a further comparison:

"Core gum may be said to be modern adaptation of British gum for foundry purposes, the same being used by color-makers to give body to certain colors for calico printing. It is about fifteen years since the writer first used it in core-making, and since that time it has become very popular in foundry practice. Previous to its introduction, there were many devices for hardening or strengthening the sand in core-making, such as clay water, salt water, sour beer, and in very small cores it was no uncommon thing in some districts to see potatoes pounded in sea sand to give cohesion to the sand, and at the same time to give porousness for venting. Since the introduction of core gum these former practices have disappeared. The indiscriminate use of core gums by many molders has, however, been the cause of a good deal of bad work. Sometimes it is used to such an extent as to make the core more of the nature of an ordinary brick, thus destroying all porousness. A core made from such a mixture as here describ-

ed can have only one result—viz., a bad casting. As far as the writer's experience of using core gum is concerned, he never uses it except for small cores, its greatest service being in green-sand work. A green-sand mold that is cored entirely closed, with no current of air passing through the cores, readily absorbs damp from the moistened atmosphere of the mold. But should the cores in such a mold be made with sea-sand and core gum this danger is greatly minimised; indeed, this is one of the greatest recommendations in its favor. If a core made with sand heavily laden with plastic matter becomes damp through lying in the mold, it is sure to blow. This blowing will be more mischievous with a core in the horizontal position than it would be with one in the vertical position. It would appear that there is great lack of knowledge regarding the use of core gum. Even those who seek to trade in it do not seem to have acquired sufficient knowledge as to its real nature, in so far as foundry work is concerned. Trade circulars advise the user to dissolve it in hot water, which cannot be properly done; and were one to boil it, the undissolved parts which float about the surface of the liquid would simply become harder. Some may say that this is of small importance, as it can be strained through a sieve; but why have this loss at all when by proper care there need be none of it? The speediest and by far the best way to dissolve core gum is by the aid of cold water.

"The following is a gum water recipe:—Take two pounds of core gum, put it into a suitable dish, then add a little cold water, taking care to add no more water than the gum is capable of absorbing. After stirring it well and it has scarcely reached a pasty condition, add a little more cold water and stir again; again beat it well with a stick and add a little more water, continuing to stir. It has now reached a semi-fluid condition. Transfer the contents as mixed to an ordinary two-gallon bucket and fill up with water. It will be seen that one pound of core gum per gallon of water is given, though this is not given as a fixed rule. In mixing sea-sand it is better if the sand is dry; then all that is required in mixing such sand for cores is to apply this gum water to bring it to the desired consistency. Cores made with such sand must belong to the higher class of castings, as this sand is insufficient to with-

stand the strain, or, as may be, the rush and flow of a heavy body of metal. While this sand is highly favored as giving completeness of outline, it is altogether unsuitable for rubbing or carding, and were one to attempt to do so such a core would collapse, its strength being entirely on the surface. Of course these remarks on sea-sand only apply to sands that may be said to be absolutely free from clay or plastic matter. There are sands somewhat similar to be got about the mouth of lakes and on certain shores containing an amount of plastic matter, and cores made from this sand will stand rubbing and carding, as well as black-washing, which allows the core being applied to heavier work than otherwise.

"Should certain conditions make a dry method of mixing preferable, add about two pounds of core gum to four ordinary buckets of dry sand; mix thoroughly together. Add water to bring it to the desired consistency. Dry black sand, sieved, will do as well as sea-sand, but as it contains an amount of plastic matter, less gum will be needed, the amount being determined by experience.

"Gum water, with a little plumbago, is very serviceable in washing a mold after it has been sleeked, this same mixture being of great service in repainting a mold that has been burned in drying. The old practice of re-black-washing was almost sure to scale off to such an extent as to make bad work. By using this wash in the manner described, it penetrates through the burned surface, which almost restores the mold to its normal condition. The writer has dusted core gum on green-sand work in order to bring out better effects. This is of greatest advantage about the gates of the mold, these parts being most exposed to the burning rush of the metal. The advantage of this is always more apparent the longer the gum lies upon the mold before being cast. This must be obvious; a green-sand mold that is damp on the surface receives the gum, which readily adheres to the mold, and, through atmospheric influences, the mold is thus improved, certain weathers being more favorable than others. In brasswork it is not so serviceable as in iron, its tendency being to give a rougher skin to the casting, in consequence of which the finisher has more trouble in tooling the castings, blunting his tool oftener than would be the case with a brass casting skinned with pea meal."

ACTIVE MEMBERS.

June 25, 1896—Abendroth Bros....................Port Chester, N. Y.
July 9, 1896—Aermotor Co..............12th, Rockwell & Fillmore, Chicago, Ill.
July 17, 1896—American Radiator Co...................Detroit, Mich.
June 29, 1896—Amsden, Alonzo D................Phoenix Foundry, Providence, R. I.
Sept. 14, 1896—Anniston Pipe & Foundry Co............Anniston, Ala.
July 22, 1896—Babington, B. B........B. B. Babington, Son & Co., Shelby, N. C.
Nov. 18, 1896—Baltimore Car Wheel Co., The............Baltimore, Md.
July 10, 1896—Barbour-Stockwell Co................205 Broadway, Cambridgeport, Mass.
July 17, 1896—Beckett, James A....W. A. Wood Mowing & Reaping Co., Hoosick Falls, N. Y.
Nov. 18, 1896—Belcher & Taylor Agricultural Tool Co., The...... Chicopee Falls, Mass
Nov. 4, 1896—Bell Co., The C. S.........................Hillsboro, O.
June 28, 1896—Blackburn, A. H..............Fuel Economizer Co., Matteawan, N. Y.
Sept. 10, 1896—Blymyer Iron Works Co., The........Cincinnati, Ohio.
Nov. 30. 1896—Brigden, Chas. H.........................Yonkers, N. Y.
Oct. 19, 1896—Buckingham, Geo. B......Arcade Malleable Iron Co., Worcester, Mass.
Nov. 18, 1896—Burlington Route Foundry..................Aurora, Ill.
July 13, 1896—Buffalo Forge Co........................Buffalo, N. Y.
Nov. 16, 1896—Christie M. E., E. W.....................Carteret, N. J.
Nov. 16, 1896—Colton & Co., G. D.......................Galesburg, Ill.
June 24, 1896—Corbin, P. & F....................New Britain, Conn.
June 11, 1896—Campbell, Twining......................Paterson, N. J.
Aug. 28, 1896—Carnegie Steel Co., The.................Pittsburg, Pa.
July 20, 1896—Carpenter, A. & Sons..............272 W. Exchange, Providence, R. I.
June 27, 1896—Cavanaugh, Francis......Quakertown Stove Works, Quakertown, Pa.
June 20, 1896—Cheney & Son, S........................Manlius, N. Y.
June 23, 1896—Choate, Chas. N., Bridgeport, Deox., Bronze & Metal Co., Bridgeport, Conn.
June 16, 1896—Colvin, Theo. H......Theo. H. Colvin Foundry Co., Providence, R. I.
June 21, 1896—Colorado Fuel & Iron Co..................Pueblo, Col.
July 1, 1896—Connersville Blower Co..................Connersville, Ind.
July 11, 1896—Condor Iron Foundry Co............East Boston, Mass.
June 26, 1896—Co-operative Foundry Co................15 Hill St., Rochester, N. Y.
Nov. 15, 1896—Davenport & Treacy Co................Stamford, Conn.

Nov. 15, 1896—Davis & Farnum Mfg. Co................Waltham, Mass.
Nov. 19, 1896—Davis Iron Works Co., The F. M............Denver, Col.
June 29, 1896—Davis Foundry Co......................Lawrence, Mass.
July 18, 1896—Day, F. M..................Hopedale Machine Co., Hopedale, Mass.
Aug. 24, 1896—Dickson Mfg. Co........................Scranton, Pa.
June 22, 1896—Dighton Furnace Co.....................Taunton, Mass.
June 29, 1896—Donaldson, J. F.........Ingersoll-Sergeant Drill Co., 640 Wolf St., Easton, Pa.
June 19, 1896—Drummond Mfg. Co....................Louisville, Ky.
Sept. 7, 1896—Dry Dock Engine Works................Detroit, Mich.
Nov. 3, 1896—DuBois Iron Works........................DuBois, Pa.
Nov. 18, 1896—Eaton, Cole & Burnham Co., The......Bridgeport, Conn.
Aug. 26, 1896—Erie Malleable Iron Co., Ltd..................Erie, Pa.
July 1, 1896—Evans, Henry Clay......Mgr. Chattanooga Car & Fdy. Co., Chattanooga, Tenn.
Dec. 7, 1896—Ferguson, Wm.......4120 N. Ashland Ave., Chicago, Ill.
June 28, 1896—Fisher, John E., Foreman Foundry, National Transit Co., Oil City, Pa.
July 1, 1896—Flagg, Stanley G. & Co....19th and Pennsylvania ave., Philadelphia, Pa.
Aug. 29, 1896—Flather, Frederick A........Lowell Machine Shop, Lowell, Mass.
June 25, 1896—Frank-Kneeland Machine Co..............54th St., Pittsburg, Pa.
Sept. 8, 1896—Frontier Iron Works.....................Detroit, Mich.
June 18, 1896—Gibby, F. W......Prest. Mechanics' Iron Fdy. Co., 38 Kemble St., Roxbury, Mass.
July 11, 1896—Gillette-Herzog Mfg. Co..............Minneapolis, Minn.
July 1, 1896—Girard Iron Works ....22d & Master, Philadelphia, Pa.
Nov. 27, 1896—Gisriel, Wm..............Maryland Brass & Metal Works Baltimore, Md.
Nov. 27, 1896—Griffing Iron Co., A. A.................Jersey City, N. J.
Nov. 18, 1896—Griffin Wheel Co........................Detroit, Mich.
July 5, 1896—Groves, S.....................Taylor, Wilson & Co., Allegheny, Pa.
July 19, 1896—Hanson, Wm........5404 Lancaster ave., Philadelphia, Pennsylvania Iron Works Co., Philadelphia, Pa.
Nov. 15, 1896—Hinckley & Egery Iron Co.................Bangor, Me.
Aug. 26, 1896—Hodge & Co., Samuel F..................Detroit, Mich.
Nov. 30, 1896—Holley, S. H...Gen. Mgr. Lake Shore Iron Works, Marquette, Mich.
July 2, 1896—Hubley Mnfg. Co........................Lancaster, Pa.
July 2, 1896—Ingersoll-Sergeant Drill Co.........Havemeyer Bldg., New York, N. Y.
July 30, 1896—James, Geo.............Mangr. Variety Iron Works, Seattle, Wash.

June 29, 1896—Jarecki Mfg. Co., Ltd., Foundry Dept............Erie, Pa.
July 23, 1896—Jobb, Chas. L..............Londonderry Iron Co., Londonderry, N. S.
Sept. 2, 1896—Jones, E. H......................143 S. Franklin St., Wilkes-Barre, Pa.
June 18, 1896—Keep, Wm. J............Supt. Michigan Stove Co., 753 Jefferson Ave., Detroit, Mich.
June 19, 1896—King, Warden & Son...................Montreal, P. Q.
June 22, 1896—Kimball, W. G...............S. G. Kimball's Sons, 127 Washington St., Newburgh, N. Y.
June 29, 1896—Kitchell, H. G................Delta Machine Co., Greenwood, Miss.
June 29, 1896—Knoeppel, John C..Foreman Foundry Buffalo Forge Co., 540 Swan St., Buffalo, N. Y.
Nov. 15, 1896—Knowles Steam Pump Works.............Warren, Mass.
June 29, 1896—Koken, Wm. T................Koken Iron Works, St. Louis, Mo.
July 9, 1896—Koons, Jos.........With L. V. R. R. Co., Weatherly, Pa.
June 16, 1896—Lane Mfg. Co.........................Montpelier, Vt.
June 27, 1896—Leechburg Fdy. & Mach. Co...........Lewis Blk., Pittsburg, Pa.
July 4, 1896—LeBaron Foundry Co..............Middleborough, Mass.
Sept. 19, 1896—Leland & Faulconer Mfg. Co............Detroit, Mich.
Sept. 2, 1896—Letchworth, O. P.....Pres. Pratt & Letchworth Co., Buffalo, N. Y.
June 29, 1896—Lincoln, Geo. H. & Co.............South Boston, Mass.
July 11, 1896—Little, Owen J......Propr. Deckertown Foundry and Machine Shops, Deckertown, N. J.
June 19, 1896—Lutterman, T. F. A...Foreman National Supply Co., 1422 Baxter St., Auburndale, O.
June 18, 1896—Magee Furnace Co......................Boston, Mass.
July 28, 1896—Maher & Flockhart......................Newark, N. J.
July 3, 1896—Malleable Iron Fittings Co..............Brandford, Conn.
July 13, 1896—Mathes, Ph...........Brittan, Graham & Mathes Co., 411 Wood St., Pittsburg, Pa.
Aug. 27, 1896—Matlack, David J...............2247 Richmond St., Philadelphia, Pa.
Sept. 21, 1896—McLagon Foundry Co...............New Haven, Conn.
Sept. 26, 1896—Michigan Malleable Iron Co..............Detroit, Mich.
Aug. 26, 1896—The Michigan Stove Co.................Detroit, Mich.
Oct. 21, 1896—Milwaukee Harvester Co.............Milwaukee, Wis.
Aug. 31, 1896—Moore, D. G.....Pres The S. L. Moore & Sons Co., Elizabeth, N. J.
June 29, 1896—Morris & Barlow...........28 Orange St., Newark, N. J.
June 29, 1896—Morris, Wheeler & Co..........16th and Market Sts., Philadelphia, Pa.
July 8, 1896—Mosher Mfg. Co.............................Dallas, Tex.

July 10, 1896—Newburgh Ice Mch. & Eng. Co., Edgar Penney, Pres., Newburgh, N. Y.
June 23, 1896—Nicholas, W. H......Foreman of Foundry P. R. R., Renova, Pa.
July 20, 1896—Northwestern Malleable Iron Co........Milwaukee, Wis.
Sept. 24, 1896—North & Judd Mfg. Co...............New Britain, Conn.
Aug. 12, 1896—Olympic Iron Works.................Tacoma, Wash.
Aug. 26, 1896—Osborne, D. M........................Auburn, N. Y.
June 25, 1896—Osgood & Hart....3 Sherman St., Charlestown Dist., Boston, Mass.
July 10, 1896—Patterson, Wm. E......Brown & Patterson, 33 Marcy Ave., Brooklyn, N. Y.
June 19, 1896—Penton, John A......Editor "Foundry," Detroit, Mich.
Sept. 22, 1896—Pittsburg Malleable Iron Co..............Pittsburg, Pa.
Nov. 27, 1896—Potter Printing Press Co...............Plainfield, N. J.
July 15, 1896—Pratt & Whitney Co.....................Hartford, Conn.
July 10, 1896—Ridgway, Craig & Son.................Coatesville, Pa.
July 18, 1896—Riehl, Wm........Nat. Fdy. & Mach. Co., Louisville, Ky.
June 19, 1896—Robinson-Rea Mfg. Co......329 Water St., Pittsburg, Pa.
June 19, 1896—Rohland, John....Supt. Coxe Iron Mfg. Co., Drifton, Pa.
July 8, 1896—Roots, P. H. & F. M. Co...............Connersville, Ind.
June 26, 1896—Russell & Erwin Mfg. Co............New Britain, Conn.
June 17, 1896—Russel, John R......Sec'y Russel Wheel & Fdy. Co., Detroit, Mich.
Sept. 7, 1896—Sawyer, James C..........Somersworth Machine Co., Dover, N. H.
June 17, 1896—Schumann, Francis..Pres't Tacony Iron & Metal Co., Tacony, Pa.
June 27, 1896—Seaman-Sleeth Co...............41st St. and Willow, Pittsburg, Pa.
Aug. 31, 1896—Sellers & Co., Wm..................Philadelphia, Pa.
Sept. 5, 1896—Sessions Foundry Co......................Bristol, Conn.
June 25, 1896—Sheppard, Isaac A. & Co...............Philadelphia, Pa.
June 29, 1896—Shickle, Harrison & Howard Iron Co......St. Louis, Mo.
June 24, 1896—Sleeth, S. D...........Westinghouse Air Brake Co., Pittsburg, Pa.
Nov. 15, 1896—Smith Co., The H. B....................Westfield, Mass.
July 1, 1896—Smith, Pemberton............N. Y. Car Wheel Works, Buffalo, N. Y.
Nov. 19, 1896—Snead-Van Alstine-Meldrum Co., The......Louisville, Ky.
June 17, 1896—Sorge, A. Jr...................1533 Marquette Bldg., Chicago, Ill.
July 15, 1896—Springer, Jos. H....Supt. Mich. Brass & Iron Works, Detroit, Mich.
July 13, 1896—St. Paul Foundry Co....................St. Paul, Minn.
Aug. 29, 1896—Stevens, W. W..........9th and Montgomery Ave., Philadelphia, Pa.

Aug. 29, 1896—Sweeney, John M...Pres't Consolidated Iron & Steel Co., Harvey, Ill.
June 1, 1896—Syracuse Chilled Plow Co................Syracuse, N. Y.
July 13, 1896—Taft, C. A......................Whitin Machine Co., Whitinsville, Mass.
Nov. 18, 1896—Taylor Iron & Steel Co.............High Bridge, N. J.
June 17, 1896—Taylor, Robt.........Chairman Taylor-Wilson & Co., Allegheny, Pa.
June 17, 1896—Taylor-Wilson & Co., Ltd..............Allegheny, Pa.
July 8, 1896—Thompson, Josiah..............J. Thompson & Co., Philadelphia, Pa.
Aug. 26, 1896—Torrance Iron Co..........................Troy, N. Y.
June 27, 1896—Treat, C. A., Mfg. Co..................Hannibal, Mo.
July 18, 1896—Trenton Malleable Iron Co.............Trenton, N. J.
Nov. 19, 1896—Union Malleable Iron Co....................Moline, Ill.
Dec. 2, 1896—Valentine, H. R.........M. D. Valentine & Bro. Co., Woodbridge, N. J.
July 8, 1896—Walker & Pratt Mfg. Co.................Watertown, Mass.
July 20, 1896—Wallis, Philip.........M. M.; L. V. R. R., Hazleton, Pa.
June 17, 1896—Waterbury-Farrell Foundry & Machine Co., Waterbury, Conn.
July 13, 1896—Watson, James......Otis Bros. & Co., 61 Hudson St., Yonkers, N. Y.
June 27, 1896—West, Thos. D....Vice-Pres. & Mngr. Thos. D. West Foundry Co., Sharpsville, Pa.
Nov. 17, 1896—Western Foundry Co...........38th St. and Albany Av., Chicago, Ill.
Nov. 15, 1896—White & Sons, Patrick..............Perth Amboy, N. J.
Sept. 2, 1896—Whitney, Asa W................1601 Callowhill St., Philadelphia, Pa.
Nov. 23, 1896—Whiteley, Burt H....................Whiteley Mall. Castings Co., Muncie, Ind.
Nov. 15, 1896—Whitney Iron Works Co., The........New Orleans, La.
Nov. 15, 1896—Whiting Foundry & Equipment Co..........Harvey, Ill.
July 3, 1896—Wilbraham-Baker Blower Co............Philadelphia, Pa.
July 15, 1896—Wood, Walter....R. D. Wood & Co., 400 Chestnut St., Philadelphia, Pa.
Sept. 2, 1896—Worthington, Henry R..............Van Brunt St., Brooklyn, N. Y.
June 18, 1896—Yagle, Wm. & Co., Ltd........32d St. & A. V. R. R., Pittsburg, Pa.

ASSOCIATE MEMBERS.

Nov. 15, 1896—Adams & Co., Hugh W.............15 Beekman St.,
New York, N. Y.

July 31, 1896—Andrew Bros.' Co.................Mnfrs. of Pig Iron,
Youngstown, O.

Dec. 2, 1896—Brown, L. S....Springfield Facing Co., Springfield, Mass.

July 12, 1896—Burget, R. A....Treas. and Gen. Mgr. Richmond Iron
Works, Richmond Furnace, Mass.

Oct. 1, 1896—Cleveland Facing Mill Co.................Cleveland, O.

June 29, 1896—Dixon Crucible Co., Jos. Mfrs. Crucibles and Foundry
Facings, Jersey City, N. Y.

July 8, 1896—Findley, A. I............Editor "Iron Trade Review,"
Cleveland, O.

Aug. 7, 1896—Garden City Sand Co..Molding Sand and Fire Brick,
Chicago, Ill.

June 17, 1896—Goodrich, F. A. & Co............Pig Iron Dealers,
926 Chamber of Commerce, Detroit, Mich.

July 1896—Gobeille Pattern Co....... ....Mfrs. of Patterns,
Cleveland, O.

July 11, 1896—Hanson & Van Winkle Co..Mfrs. of Foundry Nickel
Plating Outfits, Newark, N. J.

July 17, 1896—Howe, Arthur W—Pig Iron Dealer, 420 Bourse Bldg.,
Philadelphia, Pa.

July 10, 1896—Hussman Crucible Co.............Mfrs. of Crucibles,
810 Commercial Bldg., St. Louis, Mo.

July 6, 1896—Kirk, Dr. E..........................Philadelphia, Pa.

July 14, 1896—Kittanning Iron & Steel Mfg. Co........Kittanning, Pa.

June 16, 1896—McCormick, J. S., Co.............Foundry Supplies,
Pittsburg, Pa.

July 20, 1896—McCullough & Dalzell Co..........Mfrs. of Crucibles,
Pittsburg, Pa.

July 10, 1896—Miller, Alfred J......Vice-Pres. Whitehead Bros.' Co.,
42 S. Water St., Providence, R. I.

June 29, 1896—Millett Core Oven Co.....Mfrs. of Millett Core Oven
Brightwood, Mass.

July 3, 1896—Obermayer, S., Co..................Foundry Supplies,
Cincinnati, O.

July 6, 1896—Paxson, J. W. & Co...............Foundry Supplies,
Philadelphia, Pa.

July 20, 1896—Pettinos, Geo. F.....Pettinos Bros., Foundry Facings,
Bethlehem, Pa.

July 7, 1896—Pickands, Brown & Co., Mfrs. & Dealers of Pig Iron,
Rookery Bldg., Chicago, Ill.

June 29, 1896—Pickands, Mather & Co..Mfrs. & Dealers of Pig Iron, Cleveland, O.

July 26, 1896—Rock Run Iron & Mining Co.............Rock Run, Ala.

July 19, 1896—Rogers, Brown & Co..............Pig Iron Dealers, New York, N. Y.

July 22, 1896—Rogers, Brown & Warner..........Pig Iron Dealers, Bullitt Bldg., Philadelphia, Pa.

July 17, 1896—Tabor Mfg. Co., The........Mfrs. Molding Machines, Elizabeth, N. J.

Aug. 17, 1896—Taylor & Son, Robt. J............Mfrs. of Crucibles, Philadelphia, Pa.

July 14, 1896—Timmis & Clissold..................Bound Brook, N. J.

Oct. 31, 1896—Tradesman Publishing Co.............Chattanooga, Tenn.

June 20, 1896—Translucent Fabric Co..Mrfs. of Translucent Fabric, Quincy, Mass.

Sept. 19, 1896—Washington Coal & Coke Co..............Pittsburg, Pa.

June 30, 1896—Wells Light Mfg. Co., The......Mfrs. of Wells Light, 44-46 Washington St., New York, N. Y.

Dec. 1, 1896—Whitehead Bros Co...537 West 27th St., New York, N. Y.

LIST OF MEMBERS ARRANGED ALPHABETICALLY AS TO RESIDENCE.

ALABAMA.

Anniston—Anniston Pipe & Foundry Co.
Rock Run—Rock Run Iron & Mining Co.

COLORADO.

Denver—The F. M. Davis Iron Works Co.
Pueblo—Colorado Fuel & Iron Co.

CONNECTICUT.

Brandford—Malleable Iron Fittings Co.
Bridgeport—Chas. N. Choate Deox. Bronze & Metal Co....The Eaton, Cole & Burnham Co.
Bristol—The Sessions Foundry Co.
Hartford—Pratt & Whitney Co.
New Britain—P. & F. Corbin....North & Judd Mfg. Co....Russell & Erwin Mfg. Co.
New Haven—McLagon Foundry Co.
Stamford—Davenport & Treacy Co.
Waterbury—Waterbury-Farrell Foundry & Machine Co.

ILLINOIS.

Aurora—Burlington Route Foundry Co.
Chicago—Aermotor Co., 12th, Rockwell & Fillmore....Pickands, Brown & Co....Garden City Sand Co ...A. Sorge, Jr., 1533 Marquette Bldg. ....Western Foundry Co., 38th and Albany sts....Wm. Ferguson.
Galesburg—G. D. Colton & Co.
Harvey—John M. Sweeney, Pres't Consolidated Iron & Steel Co.... Whiting Foundry & Equipment Co.
Moline—Union Malleable Iron Co.
Muncie—Burt H. Whiteley, Whiteley Malleable Castings Co.

INDIANA.

Connersville—The Connersville Blower Co....P. H. & F. M. Roots Co.

KENTUCKY.

Louisville—The Drummond Mfg. Co....The Snead-Van Alstine-Meldrum Co....Wm. Riehl, National Foundry & Machine Co.

LOUISIANA.

New Orleans—The Whitney Iron Works Co.

MAINE.

Bangor—Hinckley & Egery Iron Co.

MARYLAND.

Baltimore—Baltimore Car Wheel Co.... Wm. Gisriel, Maryland Brass & Metal Works.

MASSACHUSETTS.

Boston—Magee Furnace Co.... Osgood & Hart, 3 Sherman St., Charlestown Dist.
Brightwood—Millett Core Oven Co.
Cambridgeport—Barbour-Stockwell Co.
Chicopee Falls—The Belcher & Taylor Agricultural Tool Co.
East Boston—Condor Iron Foundry Co.
Hopedale—F. M. Day, Hopedale Machine Co.
Lawrence—Davis Foundry Co.
Lowell—Frederick A. Flather, Lowell Machine Shop.
Middleborough—LeBaron Foundry Co.
Quincy—Translucent Fabric Co.
Richmond Furnace—R. A. Burget, Treas. and Gen. Mgr. Richmond Iron Works.
Roxbury—F. W. Gibby, 38 Kemble St.
South Boston—Geo. H. Lincoln & Co.
Springfield—L. S. Brown, Springfield Facing Co.
Tauton—Dighton Furnace Co.
Watertown—Walker & Pratt Mfg. Co.
Waltham—Davis & Farnum Mfg. Co.
Warren—Knowles Steam Pump Works.
Westfield—The H. B. Smith Co.
Whitinsville—C. A. Taft, Whitin Machine Co.
Worcester—Geo. B. Buckingham, Arcade Malleable Iron Co.

MICHIGAN.

Detroit—American Radiator Co.... Dry Dock Engine Works.... Frontier Iron Works.... F. A. Goodrich & Co.... Griffin Wheel Co.... Samuel F. Hodge & Co.... Wm. J. Keep, Supt. Michigan Stove Co.... Leland & Faulconer Mfg. Co.... The Michigan Malleable Iron Co.... The Michigan Stove Co.... John A. Penton, Editor "Foundry".... John R. Russel, Sec'y Russel Wheel & Foundry Co.... Joseph H. Springer, Supt. Michigan Brass & Iron Works.
Marquette—S. H. Holley, Gen. Mgr. Lake Shore Iron Works.

MINNESOTA.

Minneapolis—Gillette-Herzog Mfg. Co.
St. Paul—St. Paul Foundry Co.

MISSISSIPPI.

Greenwood—H. G. Kitchell, Delta Machine Co.

MISSOURI.

Hannibal—C. A. Treat Mfg. Co.
St. Louis—Hussman Crucible Co.... Wm. K. Koken, Koken Iron Works.

NEW HAMPSHIRE.

Auburn—D. M. Osborne & Co.
Dover—James C. Sawyer, Somersworth Machine Co.
Scranton—Dickson Mfg. Co.

NEW JERSEY.

Bound Brook—Timmis & Clissold.
Carteret—E. W. Christie, M. E.
Deckertown—Owen J. Little, Prop. Deckertown Foundry & Machine Shops.
Elizabeth—The Tabor Mfg. Co....D. G. Moore, Pres. The S. L. Moore & Sons' Co.
High Bridge—Taylor Iron & Steel Co.
Jersey City—Jos. Dixon Crucible Co....A. A. Griffing Iron Co.
Newark—Honson & Van Winkle Co....Maher & Flockhart....Morris &
Paterson—Twining Campbell.
Perth Amboy—Patrick White & Sons.
Plainfield—Potter Printing Press Co.
Trenton—Trenton Malleable Iron Co.
Woodbridge—H. R. Valentine, M. D. Valentine & Bro. Co.

NEW YORK.

Brooklyn—Wm. E. Patterson, 33 Marcy Ave....Henry R. Worthington, Van Brunt St.
Buffalo—Buffalo Forge Co....John C. Knoeppel, foreman Buffalo Forge Co., 540 Swan St....Pemberton Smith, New York Car Wheel Works....O. P. Letchworth, Pres. Pratt & Letchworth Co.
Hoosick Falls—Beckett A. James, W. A. Wood Mowing & Reaping Co.
Manlius—S. Cheney & Son.
Matteawan—A. H. Blackburn, Fuel Economizer Co.
Newburgh—W. G. Kimball, 127 Washington St....Newburgh Ice Machine & Engine Co.
New York—H. W. Adams & Co., 15 Beekman St....Ingersoll-Sergeant Drill Co., Havemeyer Bldg....Roger Brown & Co....The Wells Light Mfg. Co., 44-46 Washington St....Whitehead B ros. Co., 537 West 27th St.
Port Chester—Abendroth Bros.
Rochester—Co-operative Foundry Co., 15 Hill St.
Syracuse—Syracuse Chilled Plow Co.
Troy—Torance Iron Co.
Yonkers—James Watson, Otis Bros. & Co., 61 Hudson St....Chas. H. Brigden, Dock cor. River St.

NORTH CAROLINA.

Shelby—B. B. Babington, B. B. Babington, Son & Co.

OHIO.

Auburndale—T. F. A. Lutterman, Foreman National Supply Co., 1422 Baxter St.

Cincinnati—The Blymyer Iron Works Co....S. Obermayer Co.

Cleveland—The Cleveland Facing Mill Co....A. I. Findlay, Editor "Iron Trade Review"....Gobeille Pattern Co....Pickands, Mather & Co.

Hillsboro—The C. S. Bell Co.

Youngstown—Andrews Bros.' Co., Mfrs. of Pig Iron.

PENNSYLVANIA.

Allegheny—S. Groves, Taylor, Wilson & Co....Robert Taylor, Chairman Taylor, Wilson & Co....Taylor, Wilson & Co., Ltd.

Bethlehem—Geo. F.Pettinos.

Coatesville—Craig-Ridgway & Son.

Drifton—John Rohland, Supt. Coxe Iron Mfg. Co.

DuBois—DuBois Iron Works.

Easton—J. F. Donaldson, 640 Wolf St.

Erie—Jarecki Mfg. Co., Ltd....Erie Malleable Iron Co., Ltd., Box 485.

Hazelton—Philip Wallis, M. M.; L. V. R. R.

Kittanning—Kittanning Iron & Steel Mfg. Co.

Lancaster—Hubley Mfg. Co.

Oil City—John E. Fisher, Foreman Foundry, National Transit Co.

Pittsburg—The Carnegie Steel Co., Ltd....Frank-Kneeland Machine Co....Leechburg Foundry & Machine Co....Ph. Mathes, 411 Wood St., Brittain, Graham & Mathes Co....J. S. McCormick Co....McCullough & Dalzell Co....Pittsburg Malleable Iron Co....Robinson-Rae-Mfg. Co., 329 Water St....Seaman-Sleeth Co., 41st St. and Willow....S. D. Sleeth, Westinghouse Air Brake Co....Washington Coal & Coke Co....Wm. Yagle & Co., Ltd., 23d St. and A. V. R. R.

Philadelphia—Stanley G. Flagg & Co., 19th and Pennsylvania Ave....Girard Iron Works, 22d and Master....Wm. Hanson, 5404 Lancaster Ave....Arthur W. Howe....Dr. Edward Kirk, 535 N. 10th St....Morris Wheeler & Co., 16th and Market Sts....J. W. Paxson & Co....Rogers, Brown & Warner, Bullitt Bldg....Isaac A. Sheppard & Co....Robert J. Taylor & Son....Josiah Thompson, J. Thompson & Co....Wilbraham Baker Blower Co....Walter Wood, R. D. Wood & Co., 400 Chestnut St....David J. Matlack, 2247 Richmond St....Wm. Sellers & Co., Inc., 1600 Hamilton St....W. W. Stevens, 9th and Montgomery Ave....Asa W. Whitney, 1601 Callowhill St.

Quakertown—Francis Cavanaugh, Quakertown Stove Works.

Renova—W. H. Nicholas, P. R. R., Foreman of Foundry.

Sharpsville—Thos. D. West, Vice-Pres. and Mgr. Thos. D. West Foundry Company.

Tacony—Francis Schumann, Tacony Iron & Metal Co.

Weatherly—Jos. Koons, with L. V. R. R. Co.

Wilkes-Barre—E. H. Jones, 143 S. Franklin St.

RHODE ISLAND.

Providence—Alonzo D. Amsden, Phoenix Foundry....A. Carpenter & Sons, 272 W. Exchange....Theo. H. Colvin, Theo. H. Colvin Foundry Co....Alfred J. Miller, Vice-Pres. Whitehead Bros.' Co.

TENNESSEE.

Chattanooga—Henry Clay Evans, Mgr. Chattanooga Car & Foundry Co....Tradesman Publishing Co.

TEXAS.

Dallas—Mosher Mfg. Co.

VERMONT.

Montpelier—Lane Mfg. Co.

WASHINGTON.

Seattle—Geo. James, Mgr. Variety Iron Works.
Tacoma—Olympic Iron Works.

WISCONSIN.

Milwaukee—Northwestern Malleable Iron Co....Milwaukee Harvester Co.

CANADA.

Londonderry—Chas. L. Jobb, Londonderry Iron Co.
Montreal, P. Q.—Warden King & Son.

LIST OF NEW MEMBERS SINCE PUBLICATION OF LAST REPORT.

ACTIVE.

Dec. 7, 1896—Wm. Ferguson.......4120 N. Ashland Ave., Chicago, Ill.
Dec. 2, 1896—H. R. Valentine.........M. D. Valentine & Bro. Co., Woodbridge, N. J.

ASSOCIATF.

Dec. 2, 1896—L. S. Brown....Springfield Facing Co., Springfield, Mass.
Dec. 1, 1896—Whitehead Bros. Co....537 W. 27th St., New York, N. Y.